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Heart Attacks

Remain Biggest Health Risk

This story is the first in a "Working to Death" series of articles in the *International Fire Fighter* that will examine the health risks fire fighters face. More importantly, the series will look at what can be done to prevent fire fighter deaths and illustrate how some are improving the health and safety of fire fighters.

Lloyd Galey dodged a bullet. The Champaign, IL Local 1260 fire fighter suffered a heart attack in 1997 when he was just 37 years old.

Not only did he live, today Galey is healthier than ever.

"When you're lying on a hospital bed and your chest feels like it's going to erupt — at 37 — it makes a huge impact on your life," says Galey, a lieutenant and a fire fighter for 19 years. "I really feel like it was God's wake-up call that I had better make some changes in my life or I was going to be dead soon."

He started eating right and working less. He lost weight and started to exercise. Now he regularly competes in triathlons and Ironman competitions.

Not everyone gets a second chance.

Fire fighters know the gruesome statistics — about 100 fire fighters die in the line of duty each year, on average, and half of those fatalities are caused by heart attacks.

Perhaps more alarming is this: the number of line-of-duty deaths from heart attacks has remained constant since the early 1990s. It hasn't gone up significantly, and it hasn't gone down much either.

Therein lies the frustration — with all the research and all the warnings, fire fighters continue to fall victim to a killer that they know exists.

"Reducing the number of fatalities due to heart attacks has to become a priority at all levels of the fire service," says IAFF General President Harold Schaitberger. "We know it's a problem. We know the extreme exertion it takes to perform on the job is the biggest risk. But we also know how to identify other risk factors. We know how to help those at higher risk. But not enough is being done to tackle this problem, and we all have a responsibility to do more to fix that."

One conclusion stands out — many IAFF locals, in conjunction with their fire department leadership — want to find ways to reduce the risk of heart attacks among their members.

But it's also clear that those locals and those departments are in the minority. Nationally, more locals and fire departments do nothing to address the medical reality that heart attacks in the line of duty remain the number-one killer among fire fighters.

"It's obvious that taking meaningful steps will lead to meaningful results," says IAFF Assistant to the General President for Occupational Health, Safety and Medicine Richard Duffy. "But getting fire departments to make the changes is the hard part. We know we can reduce some of the risk, help our members and make sure everyone gets home at the end of their shift."

Researching the Causes

A new wave of funding, spurred by years of frustration, is encouraging researchers to search for links between fire fighting and line-of-duty deaths due to heart attacks. Some of the major links are obvious.

Researchers know that fire fighters suffer fatal heart attacks overwhelmingly because of the extreme exertion the job requires. When fire fighters also exhibit one or more additional occupational risk factors or behavioral risk factors — also called personal risk factors because they describe lifestyle choices or genetic makeup.

Diabetes and hypertension are two of the most significant behavioral risk factors, according to Tom Hales, a senior medical epidemiologist with the Fire Fighter Program at the National Institute for Occupational Safety and Health (NIOSH), a branch of the Centers for Disease Control.



The fire service Joint Labor/Management Wellness-Fitness Initiative (WFI) saves lives. See how — visit www.iaff.org/iamalive

Smoking and obesity are two other behavioral risk factors, according to Denise Smith, a professor of exercise science at Skidmore College and a research scientist at the Illinois Fire Service Institute.

A 2008 study published in the *American Journal of Cardiology* indicated that 61 percent of 87 fire fighters who died between January 1996 and July 2006 were obese. Of those 87 fatalities, 62 percent were career fire fighters. Also, 40 percent of fire fighters who die from heart attacks in the line of duty are smokers, adds Dr. Stefanos Kales, assistant professor at Harvard Medical School and director of the University's Occupational and Environmental Medicine Residency.

Those factors are significant because the work fire fighters do requires extreme exertion.

In fact, fire suppression is so physically demanding that fire fighters are up to 100 times more likely to have a heart attack while putting out a fire than when engaged in some other activity, according to Dr. Kales, lead author of a study published in the *New England Journal of Medicine* last year that is still considered the most important analysis of why IAFF members fall victim to heart attacks in the line of duty.

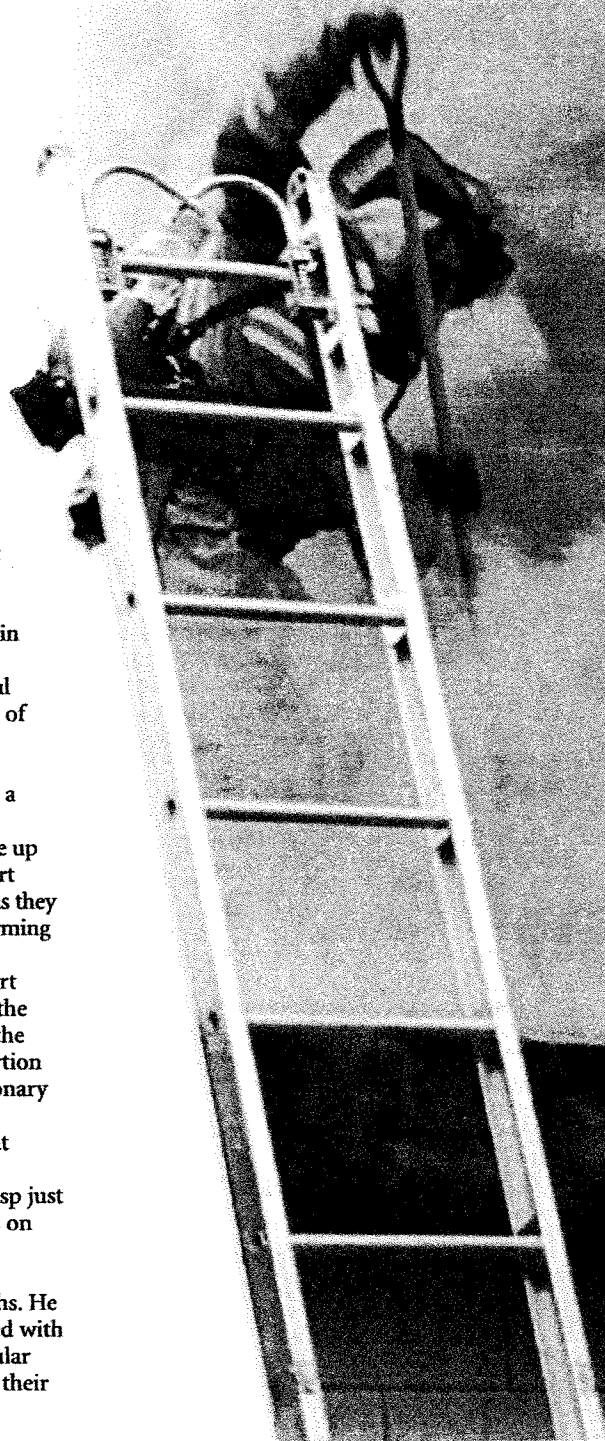
The irony is that even though actual fire calls make up a small percentage of emergency calls, the exertion caused by fire suppression by far puts fire fighters at the greatest risk of having a heart attack.

Dr. Kales reports that fire fighters are up to 14 times more likely to suffer a heart attack when responding to an alarm as they are to have a heart attack while performing some other non-emergency duty.

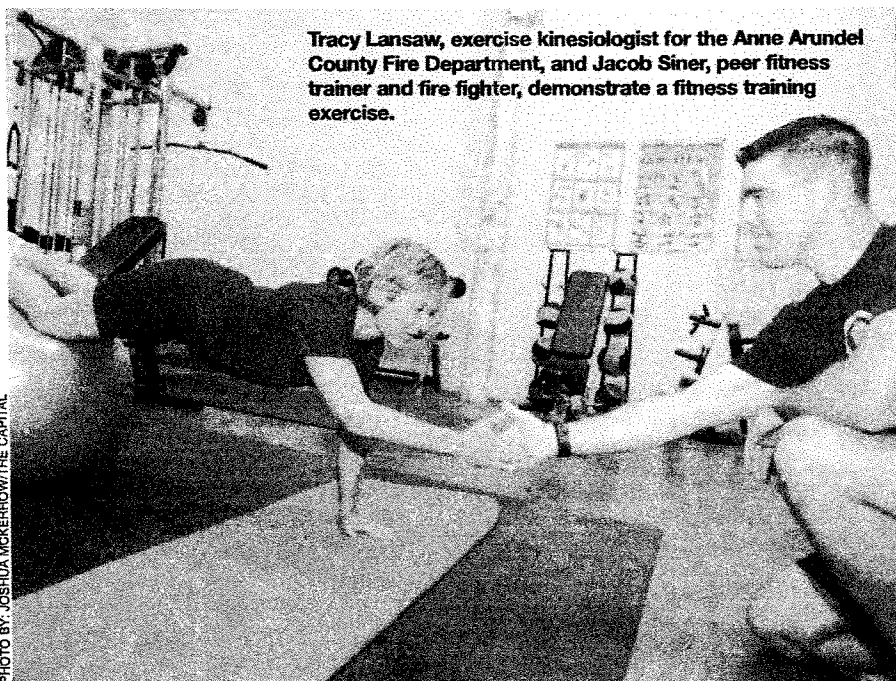
In his landmark 2007 study on heart attacks, Dr. Kales hypothesized that the risk of dying from a heart attack in the line of duty is due largely to the exertion on fire fighters with undetected coronary heart disease.

Dr. Jim Brown, associate scientist at Indiana University, says it's hard for people outside the fire service to grasp just how hard a fire fighter's heart works on the fire ground.

He accompanied members of Indianapolis Local 416 for six months. He gave 56 fire fighters a jacket equipped with sensors to monitor their cardiovascular and respiratory systems throughout their 24-hour shifts from December 2007 through May 2008.



One of the most dangerous occupational hazards for increasing the risk of a heart attack in the line of duty is the fire smoke that fire fighters inhale.



Tracy Lansaw, exercise kinesiologist for the Anne Arundel County Fire Department, and Jacob Siner, peer fitness trainer and fire fighter, demonstrate a fitness training exercise.

On Mother's Day, May 11, Dr. Brown went with fire fighters who responded to a house fire in Indianapolis. Twelve of the fire fighters who responded to the scene wore Dr. Brown's cardio-monitoring jackets, and a smaller group of four was in the middle of the fire scene.

"Those four fire fighters were working at their maximum cardiovascular output for 40 minutes," says Dr. Brown. "I was amazed at the level of cardiovascular stress they endured. If any of them had had any underlying cardiovascular disease, one of two things would have happened. They either would have had to stop working, or the work would have triggered a heart attack."

An Ounce of Prevention

The incredible risks that fire fighters face and the exertion they endure on the fire ground should serve as a warning to all fire fighters to improve their health.

"If the goal is to reduce heart attacks, there are two components that we need to address," explains Smith. "We need to lessen the risk and continue to improve our understanding of the stress of fire fighting."

Providing annual physicals and screening to detect health problems and potential red flags like high blood pressure is an important first step that can reduce one's risk. It's also an inexpensive preemptive step in light of the costly medical problems that screening can identify.

"There is a strong link between high blood pressure and heart attacks. It's important for all fire fighters to get their blood pressure checked regularly, and if it's high, it must be treated," Dr. Kales says.

In a separate study completed this year, Dr. Kales found that 56 percent of 87 fire

fighters who died of a heart attack had evidence of hypertension.

If physical exams and screenings reveal that fire fighters have heart disease, they should receive medical care to treat their condition so they can resume normal duties.

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"There are less obvious solutions, as well. Some departments have replaced standard alarms in firehouses with alarms that crescendo in a gentler tone. Replacing the loud, shrill alarms with a softer tone, especially at night while fire fighters are asleep, can moderate a fire fighter's adrenaline rush, and that's good for a person's health," says IAFF Assistant to the General President Patrick Morrison.

Quitting smoking also is crucial, according to Dr. Kales, and putting out the cigarettes can have immediate health benefits.

Fire Smoke and Occupational Risks

Fire fighters also are subjected to countless on-the-job hazards that increase their risk of suffering a heart attack on duty, and those occupational risks are critical factors in line-of-duty deaths from heart attack.

Arguably the most significant hazard is the fire smoke that fire fighters inhale.

Carbon monoxide and cyanide are two of the most common gases found in fire smoke, and both are highly dangerous. Tiny particulate matter in fire smoke also poses a risk because it can penetrate one's airways.

"I don't think fire fighters know the danger associated with small particulate matter," says Dr. Hales. "They think it's only dangerous if you're inside a burning building."

Fire fighters could reduce the risk of breathing toxic fumes simply by wearing their SCBAs at all times when at risk for breathing fire smoke.

Reducing the occupational risks of fire fighting, such as exposure to fire smoke, could reduce the number of line-of-duty deaths from heart attacks faster than addressing a fire fighter's behavior — including smoking cessation and eating right — because of the potential for lifestyle changes to effect change slowly.

"We can address some occupational factors right away, and we should be able to see a tick down in the number of line-of-duty deaths if you address occupational factors," Dr. Hales says.

Good Old-Fashioned Exercise

In 1996, the IAFF and the International Association of Fire Chiefs began the Fire Service Joint Labor/Management Wellness-Fitness Initiative to bolster physical fitness among members.

Fire departments participating in the Wellness-Fitness Initiative have had success improving the health and welfare of fire fighters — and cutting health care costs — but few departments have taken the same steps to promote fitness.

A 2001 needs assessment of the U.S. fire service by the National Fire Protection Association (NFPA) found that 73 percent of fire departments had no fitness and health programs.

"Fire fighting is incredibly stressful on the entire body," says Smith. "It causes near maximum heart rates, and it begins as soon as the alarm goes off. It continues on the way to the fire and on the fire ground. Being in shape is absolutely critical."

While 45 to 50 fire fighters die from heart attacks in the line of duty each year, many more suffer from heart attacks and live. A survey in 2006 indicated that about 1,000 fire fighters had non-fatal heart attacks in the line of duty.

"Reducing a fire fighter's weight should be a top priority," says Smith. "Fire fighters who are obese are putting themselves at

risk because fire fighting and obesity are a deadly combination."

In addition to shedding pounds, fire fighters can boost their health through exercise. Dr. Kales notes that aerobic activity — walking, running, bicycling and swimming — will improve the heart's efficiency and reduce one's risk of a heart attack.

Dr. Brown agrees that aerobic exercise is important, but argues that it's given too much emphasis and that increasing one's strength is too often overlooked.

"Cardiovascular exercise is important for everybody, but to look at it as the only exercise that's necessary is wrong," he explains. "We need to incorporate musculoskeletal training as well. It seems everyone is focused on cardio, but I would like to see more well-rounded training programs. Everyone is different. Exercise programs should be centered on the individual. Let's not look at fire fighters as a single group."

While researchers debate which form of exercise is better, they all agree that engaging in physical activity is better than remaining sedentary.

That's why the IAFF and IAFC continue to encourage departments to fully implement the Wellness-Fitness Initiative.

IAFF Health and Safety Director Jim Brinkley stresses that annual physicals and screening to gauge one's cholesterol, blood pressure and to identify other potentially life-threatening medical conditions always should precede any exercise regime.

"You can't do anything about age or heredity that could lead to heart attack, but there are a lot of behaviors you can control to improve your health," he says. "You can lower your blood pressure and cholesterol, quit smoking and lose weight. Annual physicals and screening for risk factors are important first steps to determine what changes you need to make to have a better chance to stay alive while doing this dangerous work."

At What Cost?

Many cities have balked at the cost of the Wellness-Fitness Initiative and other fitness programs, arguing that tight budgets make it difficult to fund fitness programs.

However, a new study by the IAFF, to be released later this year, will outline the financial savings at fire departments

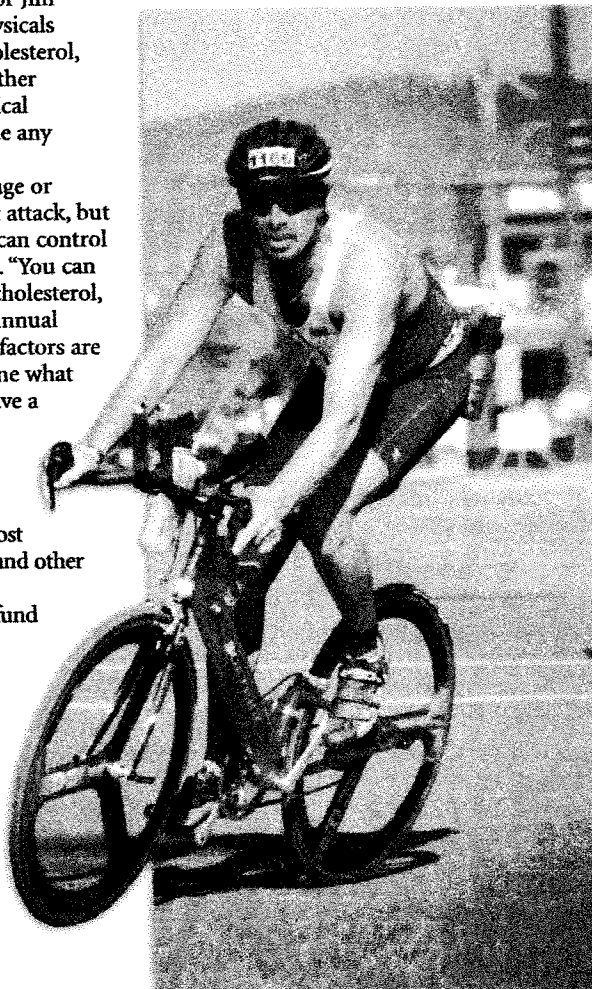
Champaign, IL Local 1260 member Lloyd Galey races in an Ironman competition in Coeur d'Alene, Idaho. Galey suffered a heart attack in 1997 before embracing a fitness regimen to improve his health.

participating in the Wellness-Fitness Initiative.

"Studies are being done and they show that Wellness-Fitness Initiatives are cost effective," says Dr. Hales. "The more studies that are done that prove that, the less city managers can hide their heads in the sand."

Departments participating in the Wellness-Fitness Initiative have lower worker's compensation claims and their fire fighters missed less work due to illness than departments not in the Wellness-Fitness Initiative, according to the new report. Departments not participating in the Wellness-Fitness Initiative spent \$1.3 million more per year because of higher compensation claims and missed work.

"The truth is that the cost of not funding a Wellness-Fitness Initiative far exceeds the cost of funding the program," says Brinkley. "Departments that have wellness-fitness programs are making a good investment in our most valuable resource — our members. When departments don't have wellness-fitness programs because city managers and elected officials don't think it is worth the money, then fire fighters pay with their lives." ■



Working to Death — By the Numbers

(for professional fire fighters)

100 Line-of-duty deaths each year, on average

100 Times more likely to have a heart attack while putting out a fire than when engaged in some other activity (Source: New England Journal of Medicine)

50 Line-of-duty deaths a year due to heart attack, on average

70 Percent of fire departments with no program to promote fitness (Source: NFPA)

40 Percent of fire fighters who die from heart attacks in the line of duty and are smokers (Source: New England Journal of Medicine)

14 Times more likely fire fighters are to suffer a heart attack when responding to an alarm than when performing some other non-emergency duty (Source: New England Journal of Medicine)

Fighting Fires. Fighting Cancer.

Michael Dubron knew he could die in a fire any day. But he didn't expect cancer to threaten his life.

A member of Los Angeles County, CA Local 1014, Dubron was diagnosed with colorectal cancer in 2003, when he was just 39 years old.

"They gave me one to three years to live," Dubron says. "I was blindsided. I was in absolute disbelief."

Dubron underwent surgery, and he's been cancer-free for more than five years.

Fighting fires poses obvious risks, but Dubron's medical battle — and the battles that hundreds of fire fighters wage each year against the disease — proves that cancer can be as deadly as any fire.

If you're fighting fires, chances are you may also fight cancer one day.

"We understand now that cancer is a big concern in the fire service," Dubron says.

A small but growing body of evidence shows that cancer poses a significant threat to fire fighters than the general public. That doesn't surprise researchers who say the toxic soup of carcinogens in fire smoke that fire fighters are exposed to likely is the primary reason that first responders fall victim to a range of cancers.

"We aren't making this up," says IAFF General President Harold Schaitberger. "The connection between fire fighting and cancer is real and there is scientific data to support our position. But we can't stop there; we must continue to learn more so we can prevent our members from contracting this horrible disease and help them if they do."

Without question, fire fighters have an increased risk of cancer because of the multiple chemicals they're exposed to on the job, notes Grace LeMasters, a professor of epidemiology at the University of Cincinnati and the lead author of the 2006 analysis that studied the medical information of about 110,000 fire fighters.

Smoke from burning computers, televisions and other plastics, and furniture and building materials in older structures all can release harmful toxins. Those materials can be laced with dangerous metals — lead, cadmium and uranium — or minerals — like asbestos. The list of carcinogens that fire fighters are exposed to is lengthy, and it includes known cancer-causing agents including polycyclic aromatic hydrocarbons.

Less Exposure

Fire fighters can't avoid fire smoke, but they can limit their exposure to carcinogens by wearing their breathing apparatus while they're on the fire ground, says Tom Hales, a senior medical epidemiologist with the Fire Fighter Program at the National Institute for Occupational Safety and Health (NIOSH), a branch of the Centers for Disease Control.

"Many fire fighters don't wear masks unless they're inside a structure," Hales says. Fire fighters who are on the fire ground or in the vicinity of a fire run the risk of inhaling fire smoke and exposing themselves to poisonous carcinogens if they don't wear their breathing apparatus.

"I think that the culture in the fire service is to turn on your air only when you need it," Hales continues. "A lot of fire fighters save it until they're inside a structure. If they're doing fire suppression outside, frequently they turn off their air and take off their masks. If you know you're going to be exposed to fire smoke, you should wear your mask."

Fire fighters should continue to wear their breathing apparatus and personal protective clothing during overhaul operations. Fire fighters are exposed to carcinogens even if they don't inhale fire smoke, according to LeMasters.

Soot, which contains polycyclic aromatic hydrocarbons, can be absorbed through the skin. Researchers believe the dangerous hydrocarbons can lead to lung, bladder and skin cancer.

"People think soot is benign but it is not, and most fire fighters coming back from a fire are covered in soot," LeMasters notes. Further, personal protective equipment doesn't provide sure-fire protection from exposure to cancer-causing agents.

But risks aren't limited to the fire ground.

The IAFF has found that many firehouses still don't properly control diesel exhaust to the outdoors, placing fire fighters at risk of inhaling benzene-laced diesel exhaust, which is a cancer-causing agent.

"Fire fighters clearly are exposed to a lot of carcinogens during their work. Some of those are on the fire ground, and some are not," Hales says.

In addition to wearing a breathing apparatus on the fire ground, fire fighters can limit exposure to carcinogens simply by taking a shower after returning from a fire and properly

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cleaning personal protective equipment to wash away toxins, according to LeMasters.

Showering and cleaning equipment also prevent fire fighters from carrying carcinogens home and exposing their families to carcinogens.

Early Detection, A Better Chance

Cancer doesn't have to be a death sentence.

Many cancers respond to treatment if they're detected early. According to Hales, early detection is very effective in fighting breast, testicular and colon cancer, melanoma and Hodgkin's lymphoma.

The IAFF has been a leader in cancer prevention efforts, research and education for decades. IAFF Assistant to the General President for Occupational Health, Safety and Medicine Rich Duffy says, "Fire fighters also need to fully implement and participate in the Wellness-Fitness Initiative (WFI) so they can get regular medical checkups. They also need to get past the reluctance and hesitation and go to the doctor regularly."

The IAFF has also developed a Cancer Registry to further characterize the increased risk to fire fighters for developing cancer.

Dubron, who started the Fire Fighters Cancer Support Network (www.firefightercancersupport.org) in 2005 to help fire fighters who are diagnosed with cancer, says, "We're not invincible. We're always answering everyone else's 911 calls. We're not used to asking for help when we get diagnosed with cancer."

When Dubron began the cancer network, the only support group endorsed by the IAFF for fire fighters with cancer, about three fire fighters a month called for information on cancer. Now Dubron sends information to about 200 fire fighters each month.

Cancer education needs to begin as soon as a fire fighter's career begins because the risks are so great. "Not only do fire fighters need to enroll in the WFI, fire departments need to be more proactive by addressing the dangers of cancer, talking about prevention and embracing testing and screening so cancer can be found as early as possible," Dubron says.

"We talk about hose lays and extrication and other important fire service issues with new recruits, but we also need to talk about cancer," he continues. "We need to talk about prevention, and we're doing better. Ten years ago we weren't talking about cancer like we are now."

With the addition of the Cancer Registry, the IAFF continues its research and data collection efforts to assist members in preventing, detecting and battling cancer. States and provinces also need to step up. Because of the IAFF's efforts, there is now widespread acknowledgement of the link between cancer and fire fighting, and the IAFF and its affiliates have been able to pass presumptive disability laws covering some forms of cancer in 26 states and seven Canadian provinces.

"Presumption is the right thing to do, and all states and provinces need to look out for the health and welfare of our members who get sick in the line of duty," Duffy says.

More research in the scientific community will also help.

More Studies, More Answers

At least 32 separate studies have been conducted examining the link between cancer and the hazards of the fire service. Even though it's widely accepted based on those studies that fire fighters are at greater risk of getting cancer because of their exposure to carcinogens, research must continue to determine which carcinogens pose the greatest threat to first responders or how to best protect fire fighters from contracting specific cancers in either male or female first responders.

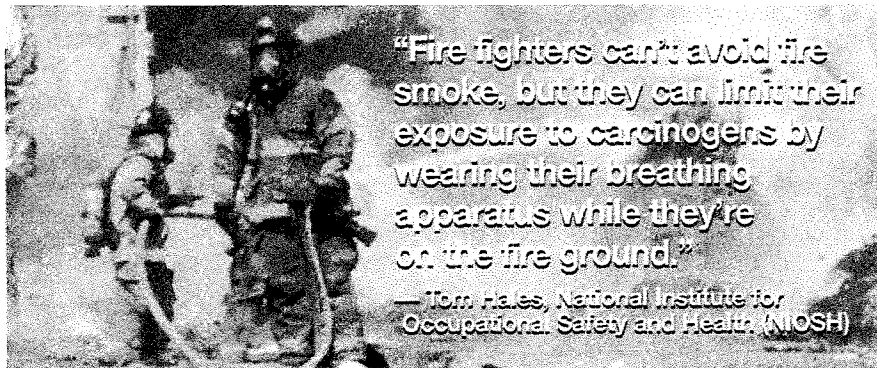
Dr. Letitia Davis, with the Massachusetts Department of Health, points out in her 2008 study of cancer in Massachusetts fire fighters that a wide range of conclusions by researchers

revealed that fire fighters are twice as likely as the general population to develop testicular cancer. Fire fighters also face a 50 percent greater chance of contracting multiple myeloma, a deadly cancer that attacks bone marrow, and non-Hodgkin's lymphoma. They are 40 percent more likely to develop skin cancer and 30 percent more likely to develop malignant melanoma, prostate, brain and rectal cancer.

A 2001 study of Philadelphia fire fighters — partially funded by the IAFF — reached some of the same conclusions in LeMasters' research. It found that fire fighters are at greater risk, compared to the general population, of getting non-Hodgkin's lymphoma and multiple myeloma.

But those studies don't get to the heart of the problem, says Melissa McDiarmid, professor of medicine and director of the University of Maryland Occupational Health Program.

Epidemiological studies measure risk based on the number of fire fighters who



in existing cancer studies proves just one thing — the need for further research.

The IAFF funded and participated in three studies of women in the fire service and the reproductive hazards for female fire fighters, but there are still too few studies on the health of women fire fighters and what role exposure to carcinogens plays in those who are diagnosed with breast, ovarian or cervical cancer.

Many studies also fail to account for the health of IAFF retirees, and that's significant because the physical demands of the job force many fire fighters to retire when they're still relatively young, but their exposure to carcinogens may not lead to cancer until later in life.

"Pinpointing the cause of cancer is extremely difficult because fire fighters aren't exposed to one agent," explains LeMasters. "They're exposed to multiple cancer-causing agents. Because of the multiple exposures and the multiple routes of exposure — they inhale carcinogens, and carcinogens are absorbed through the skin — it is also highly unlikely for fire fighters to get only one type of cancer."

LeMasters was the lead author in the 2006 University of Cincinnati analysis that

have contracted cancer in the past.

McDiarmid argues that there needs to be more emphasis on studying the toxic nature of the fire smoke that fire fighters inhale.

"We have to move from the qualitative to the quantitative," says McDiarmid. "By that I mean moving beyond studies that merely list the toxic substances to studies that quantify concentrations of those substances. That will help refine the risk assessments. It will get us closer to the truth because the risk is higher than the epidemiological studies are indicating."

Hales says, "Until we know more, limiting exposure to carcinogens is crucial."

NIOSH has never conducted its own study of cancer in fire fighters, but Hales and his colleague, Travis Kubale, hope to secure funding for a new cancer study that will examine 22,000 fire fighters in 10 fire departments.

"Prevention is the key, and what I want to find out is whether prevention at the fire ground or prevention in the firehouse is more effective at reducing cancer. That's how we can help," Hales says. ■

State/Provincial Presumptive Disability Laws

Alabama	known carcinogen which is reasonably linked to the disabling cancer
Alberta	Leukemia, brain, bladder, lung, ureter, kidney, colorectal, non-Hodgkins Lymphoma
Alaska	brain, malignant melanoma, leukemia, non-Hodgkin's lymphoma, bladder, ureter, kidney
Arizona	brain, bladder, rectal, colon, lymphoma, leukemia, adenocarcinoma or mesothelioma
British Columbia	Leukemia, bladder, lung, skin, liver
California	demonstrate he or she was exposed to a known carcinogen as defined by the IARC
Colorado	cancer of the brain, skin, digestive system, hematological system or genitourinary system
Illinois	cancer involved must be a type caused by exposure to heat radiation or a known carcinogen as defined by the IARC
Indiana	cancer that is caused by a known carcinogen to which an individual is at risk for occupational exposure
Kansas	type of cancer which may in general result from exposure to heat radiation or a known carcinogen
Louisiana	bladder, brain, colon, liver, pancreas, skin, kidney
Manitoba	gastrointestinal tract, leukemia, lymphoma, multiple myeloma
Maryland	Leukemia, brain, bladder, lung, ureter, kidney, colorectal, non-Hodgkins Lymphoma, testicular, esophageal
Maryland	has leukemia or pancreatic, prostate, rectal or throat cancer that is caused by contact with a toxic substance
Massachusetts	cancer affecting the skin or the central nervous, lymphatic, digestive, hematological, urinary, skeletal, oral or prostate systems, lung or respiratory track
Minnesota	cancer of a type caused by exposure to heat radiation or a known or suspected carcinogen as defined by the IARC
Missouri	cancer affecting the skin or the central nervous, lymphatic, digestive, hematological, urinary, skeletal, oral, breast, testicular, genitourinary, liver or prostate systems, as well as any condition of cancer which may result from exposure to heat or radiation or to a known or suspected carcinogen as determined by the IARC
Nebraska	cancer affecting the skin or the central nervous, lymphatic, digestive, hematological, urinary, skeletal, oral or prostate systems
Nevada	exposed to a known carcinogen as defined by the IARC
New Brunswick	IAFF is working to obtain specific language
New Hampshire	cancer involved must be a type caused by exposure to heat, radiation, or a known or suspected carcinogen as defined by the IARC (legislation never funded)
New York	cancer affecting the lymphatic, digestive, hematological, urinary, neurological, breast, reproductive or prostate systems
North Dakota	cancer is one which arises due to exposure to smoke fumes or carcinogenic poisonous toxic or chemical substances
Nova Scotia	cancer or other disease that is prescribed by the Governor in Council by regulation
Oklahoma	existence of any cancer which was not revealed by the physical examination passed by the member upon entry into the department
Ontario	Leukemia, brain, bladder, ureter, kidney, colorectal, non-Hodgkins Lymphoma, esophageal
Rhode Island	disabling occupational cancer which develops as a result of the inhalation of noxious fumes or poisonous gases
Saskatchewan	Leukemia, brain, bladder, lung, ureter, kidney, colorectal, non-Hodgkins Lymphoma, testicular
South Dakota	impairment of health caused by cancer
Tennessee	cancer resulting in hospitalization, medical treatment or any disability
Texas	cancer that may be caused by exposure to heat, smoke, radiation or a known or suspected carcinogen as determined by the IARC
Vermont	limited to leukemia, lymphoma or multiple myeloma and cancers originating in the bladder, brain, colon, gastrointestinal tract, kidney, liver, pancreas, skin or testicles
Virginia	Leukemia or pancreatic, prostate, rectal, throat, ovarian or breast cancer
Washington	brain cancer, malignant melanoma, leukemia, non-Hodgkin's lymphoma, bladder cancer, ureter cancer and kidney cancer
Wisconsin	skin, breast, central nervous system or lymphatic, digestive, hematological, urinary, skeletal, oral or reproductive systems

State	Heart Disease	Lung Disease	Cancer	Infectious Diseases
Alabama	✓	✓	✓	✓
Alaska	✓	✓	✓	✓
Arizona			✓	✓
Arkansas			✓	✓
California	✓		✓	✓
Colorado			✓	✓
Connecticut	✓			
District of Columbia				
Delaware				
Florida	✓			✓
Georgia	✓	✓		
Hawaii	✓	✓		
Idaho	✓	✓		✓
Illinois	✓	✓	✓	✓
Indiana	✓	✓	✓	✓
Iowa	✓	✓		
Kansas	✓	✓	✓	
Kentucky				
Louisiana	✓	✓	✓	✓
Maine	✓	✓		✓
Maryland	✓	✓	✓	
Massachusetts	✓	✓	✓	
Michigan	✓	✓		
Minnesota	✓		✓	✓
Mississippi				
Missouri	✓	✓	✓	
Montana				
Nebraska			✓	
Nevada	✓	✓	✓	
New Hampshire	✓	✓	✓	
New Jersey	pending	pending	pending	pending
New Mexico	pending	pending	pending	pending
New York	✓	✓	✓	✓
North Carolina	pending	pending	pending	pending
North Dakota	✓	✓	✓	✓
Ohio	✓	✓		
Oklahoma	✓	✓		
Oregon	✓	✓	pending	pending
Pennsylvania	✓	✓	pending	✓
Rhode Island		✓	✓	✓
South Carolina	✓	✓		
South Dakota	✓	✓	✓	
Tennessee	✓	✓	✓	
Texas	✓	✓	✓	✓
Utah	✓	✓		
Vermont	✓		✓	
Virginia	✓	✓	✓	✓
Washington	✓	✓	✓	✓
West Virginia			✓	
Wisconsin	✓	✓	✓	
Wyoming				
Province				
Alberta	✓		✓	
British Columbia			✓	✓
Manitoba	✓	✓	✓	
New Brunswick				✓
Newfoundland				
Northwest Territory				
Nova Scotia			✓	
Ontario	✓		✓	
Prince Edward Island				
Quebec				
Saskatchewan	✓			
Yukon				